

WHAT IS CLAIMED IS:

1. A mold cooling device having a pump section for feeding a cooling liquid to a fluid flow passageway formed in a mold, comprising

an air feeding and discharging circuit which effects the driving of said pump section by air and the feeding of air to said fluid flow passageway, the arrangement being such that the cooling liquid can be continuously fed from said pump section to said fluid flow passageway.

2. A mold cooling device as set forth in Claim 1, wherein said pump section comprises a first cylinder chamber and a second cylinder chamber which are coaxially arranged in series, a first piston and a second piston which are disposed in said first and second cylinder chambers, respectively, and a piston rod for connecting said two pistons to each other, wherein during both periods of forward and backward movements of both said pistons attending on the feeding and discharging of air to and from said first cylinder chamber, the cooling liquid is fed from said second cylinder chamber to the fluid flow passageway of said mold.

3. A mold cooling device as set forth in Claim 1, wherein said mold is designed to form the holed convex portion of a cast article between the pin section having said fluid flow passageway formed therein and the cavity portion surrounding the outer periphery of said pin section, and the temperature adjustment of the outer surface of said pin section and the hole inner surface of the holed convex portion contacting the same is made on the basis of (1) the feeding of cooling liquid to said fluid flow

passageway and (2) the recuperative action which is consequent on the feeding of air to said fluid flow passageway immediately after stoppage of said feeding of cooling liquid.

4. A mold cooling device as set forth in Claim 3, wherein letting (D1) be the outer diameter of said pin section, (t1) be the outer peripheral thickness of said pin section, and (Dx) be the outer diameter-corresponding dimension of the holed convex portion of said cast article, (T1) be $-5.103 + (0.621 \times Dx) - (1.068 \times D1) + (3.61 \times t1)$,

the time (T) for feeding cooling liquid to the fluid flow passageway after completion of the pouring of molten metal into said mold is set so that the relation $T1 - 0.5 \text{ seconds} \leq T \leq T1 + 0.5 \text{ seconds}$ is satisfied.

5. A mold cooling device as set forth in Claim 4, wherein immediately after the stoppage of the feeding of cooling liquid to said fluid flow passageway, air is fed to said fluid flow passageway for 5 seconds or more.

6. A mold cooling device as set forth in Claim 5, wherein the feeding of air to said fluid flow passageway causes the outer surface temperature of said pin section to terminate within the temperature range of 200 - 250°C.

7. A mold cooling device as set forth in Claim 3, wherein an opening/closing valve for opening/closing said discharge passageway is installed in a discharge passageway for air from said fluid flow passageway.

8. A mold cooling device as set forth in Claim 1, wherein said fluid flow passageway is constructed in such a manner that

concentrically arranged inner and outer pipes are connected to a bottom-closed cooling hole, which is formed in the mold to have a bottom surface on the front end, so that the front end opening in the inner pipe lies closer to said bottom surface than does the front end opening in the outer pipe, the inner passageway of said inner pipe serving as a forward passageway for cooling liquid, the between-pipe passageway between both said pipes serving as a backward passageway for cooling liquid, the central region of the bottom surface of said bottom-closed cooling hole being formed with a flat surface portion, whose outer peripheral region is formed with a curved surface portion which continuously extends from said flat surface portion to the inner peripheral surface of the bottom-closed cooling hole.

9. A mold cooling device as set forth in Claim 8, wherein the diameter of said flat surface portion is set at a larger value than the inner diameter of said inner pipe.

10. A mold cooling device as set forth in Claim 8, wherein said curved surface portion exhibits a substantially arcuate shape in its axis-containing section.

11. A mold cooling device as set forth in Claim 1, wherein said fluid flow passageway is constructed in such a manner that concentrically arranged inner and outer pipes are connected to a bottom-closed cooling hole, which is formed in the mold to have a bottom surface on the front end, so that the front end opening in the inner pipe lies closer to said bottom surface than does the front end opening in the outer pipe, the inner passageway of said inner pipe serving as a forward passageway

for cooling liquid, the between-pipe passageway between both said pipes serving as a backward passageway for cooling liquid, spacing dimension between the bottom surface of said bottom-closed cooling hole and the front end of said inner pipe being set at not more than 5 times the inner diameter of said inner pipe.

12. A mold cooling device as set forth in Claim 11, wherein the spacing dimension between the bottom surface of said bottom-closed cooling hole and the front end of said inner pipe is set at 2.0 - 5.0 mm.

13. A mold cooling device as set forth in Claim 11, wherein the flow channel area of the cooling hole inner passageway, which is formed between the inner peripheral surface of said bottom-closed cooling hole and the outer peripheral surface of said inner pipe, is set at 1.5 - 2 times the flow channel area of said inner pipe.